PMP or Lesser Rainfall What's the Risk?

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MPP vs PMP

- Older HMRs
  - Maximum Possible Precipitation – MPP
    - Absolute maximum rainfall possible
- Probable Maximum Precipitation – PMP
    - Estimates of maximum rainfall
    - Determined by hydrometeorologists
      - Different estimates determined by each analyst
    - Probable – the most likely estimate determined by various hydrometeorologists
- "Probable" in Probable Maximum Precipitation does not refer to risk of extreme rainfall occurring

PMP

Definition:

The theoretically **GREATEST** depth of precipitation for a given duration that is physically possible over a given storm area at a particular geographic location at a certain time of year (HMR 57, 1994)

Greatest = Zero Risk

PMP

- **But really, is there any risk in PMP values?**
- **Theoretical values computed by weather people**
  - **There are no physics models**
  - **Based on greatest rainfall from storms in the last 100 years**
- **Greatest depth of precipitation**
  - **Use procedures developed 65 years ago**
- **Physically possible**
  - **Based on judgments of meteorologists**
- **Geographic region**
- **Certain time of year**

- **OK …. so maybe not completely Zero Risk**

PMP used to Compute PMF

PMF Definition:

- The flood resulting from PMP
- Applicable snow melt coupled with the worst flood-producing catchment conditions
- Realistically expected in the prevailing meteorological conditions

PMF

So ….. We now have a flood based on

- **The theoretically greatest rainfall that is physically possible**
- **Realistically expected worst flood-producing catchment conditions**

- **Let's assume that what we have done is reliable….Then are we OK?**

Having Designed to the PMF
A couple of real cases

Hurricane Irene: Northeastern US, August 2011

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- **Dam demonstrated to pass the PMF using a site-specific PMP analysis**
  - **Heavy rainfall began over the watershed**
  - **The power failed at the dam and the back-up generator (tested weekly) failed**
  - **Fortunately a construction generator was available and used to open gates**
- **The flood was less than the PMF but ……**

Having Designed to the PMF
A couple of real cases

- **Estes Park: Lawn Lake Dam, July 1982**
  - **Clear night, no rainfall**
  - **Sunny day failure (OK starry night failure)**
  - **Limited life lost because of service personnel warning**
  - **Dam passed the PMF but …….**

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Rainfall

- Rainfall occurs with various levels of intensity
  - 1-year annual recurrence interval (ARI)
  - PMP
- Smaller events together with unrelated issues can cause significant problems
- Designing to the PMF does not eliminate all potential problems

Challenge

- **Given: Must consider the PMP as it contributes to the PMF**
- **Risks of lesser rainfall events with unrelated hazards should be considered**
- **Snowmelt – even with zero rainfall – can produce significant flooding**
  - **Example: Colorado Rocky Mountains**
  - **Elevations above 7,500 ft (2,300 m)**
  - **Paleoflood evidence shows largest floods are not associated with rainfall events**

Take-Home Message

- Extreme events are important
- Less events can be really significant
- Risk Informed Decision Making
  - Consider the full spectrum of risks
  - Consider combinations of risks
    - Each may not attract attention
    - In combination could be a Big Problem

????? Questions ?????

(Remember Lunch is Waiting)